



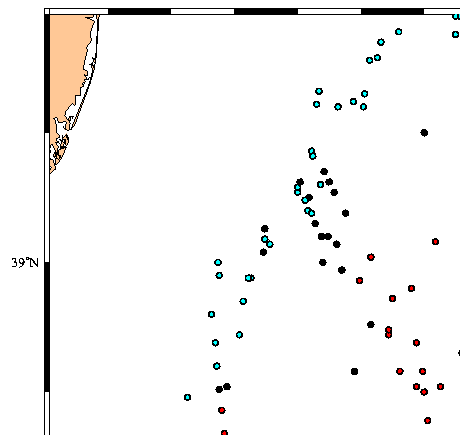
Capturing Uncertainty DRI

NRL Contribution

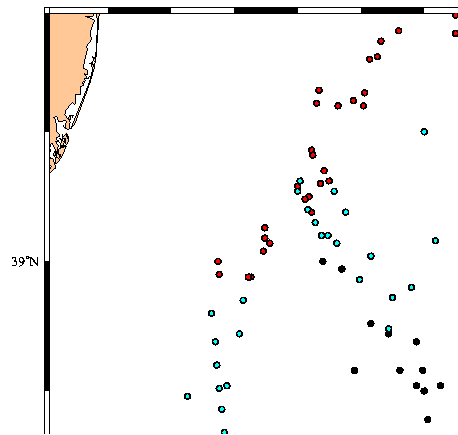
Pat Gallacher

NRL

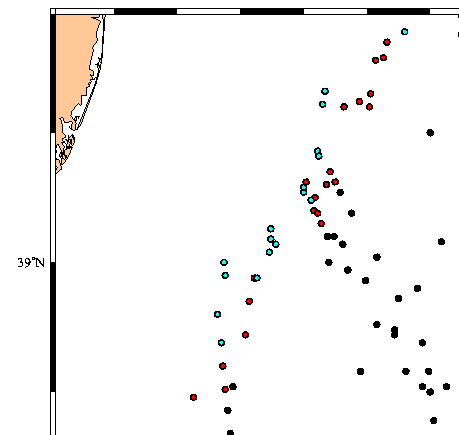
nest2 2000 : nclust=3



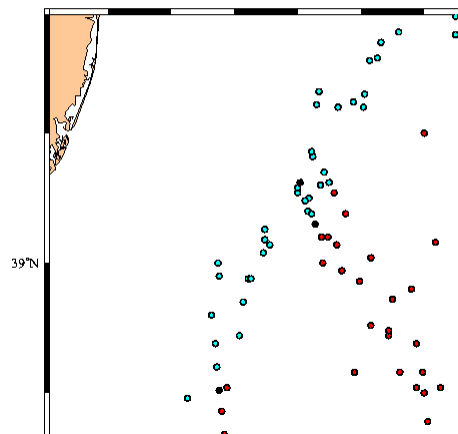
nest2 2002 : nclust=3



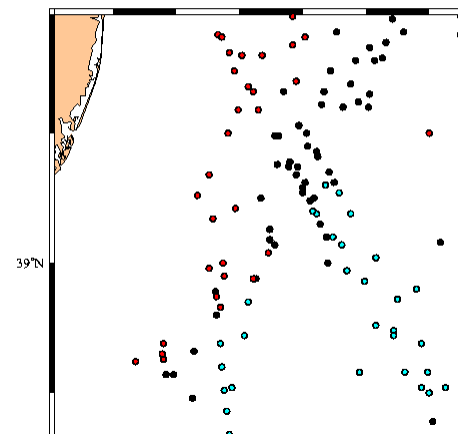
nest2 2003 : nclust=3



nest2 all : nclust=3



nest2 moods : nclust=3



Navy Coastal Ocean Model (NCOM)

- Combined sigma-z vertical coordinate
 - improves simulations over steep topography
- Nesting
 - allows submesoscale regions, $\Delta x = O(10-100\text{m})$
 - inside mesoscale regions, $\Delta x = O(1-10\text{km})$
- Based on Princeton Ocean Model (POM) physics
- And Coupled Ocean Atmosphere Prediction System (COAMPS) numerics

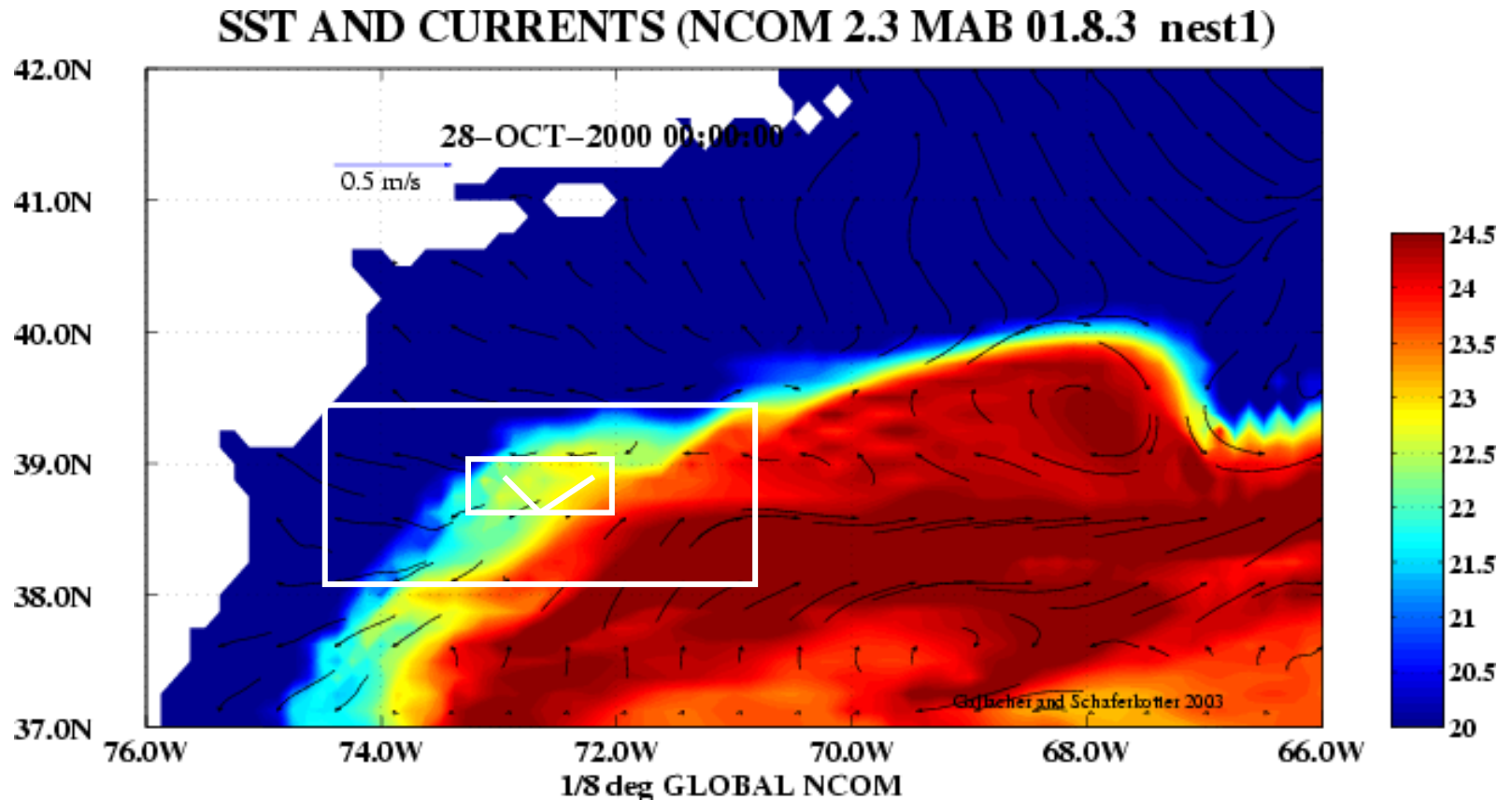
Current Grids

- Horizontal
 - C grid, $dx = dy = 1/8^\circ$, 12km
 - First nest, $dx = dy = 1/24^\circ$, 4km
 - Second nest, $dx = dy = 1/72^\circ$, 1.33km
- Vertical
 - 41 levels, 21 sigma, 20 z
 - dz varies between approx. 1m and 100m
- Bathymetry
 - DBDB5 enhanced with DBDB2 and Sandwell and CIA coastline (Ko and McKinney)
- Temporal
 - Leapfrog, $dt = 360$ sec, $dt = 120$ sec, $dt = 40$ sec

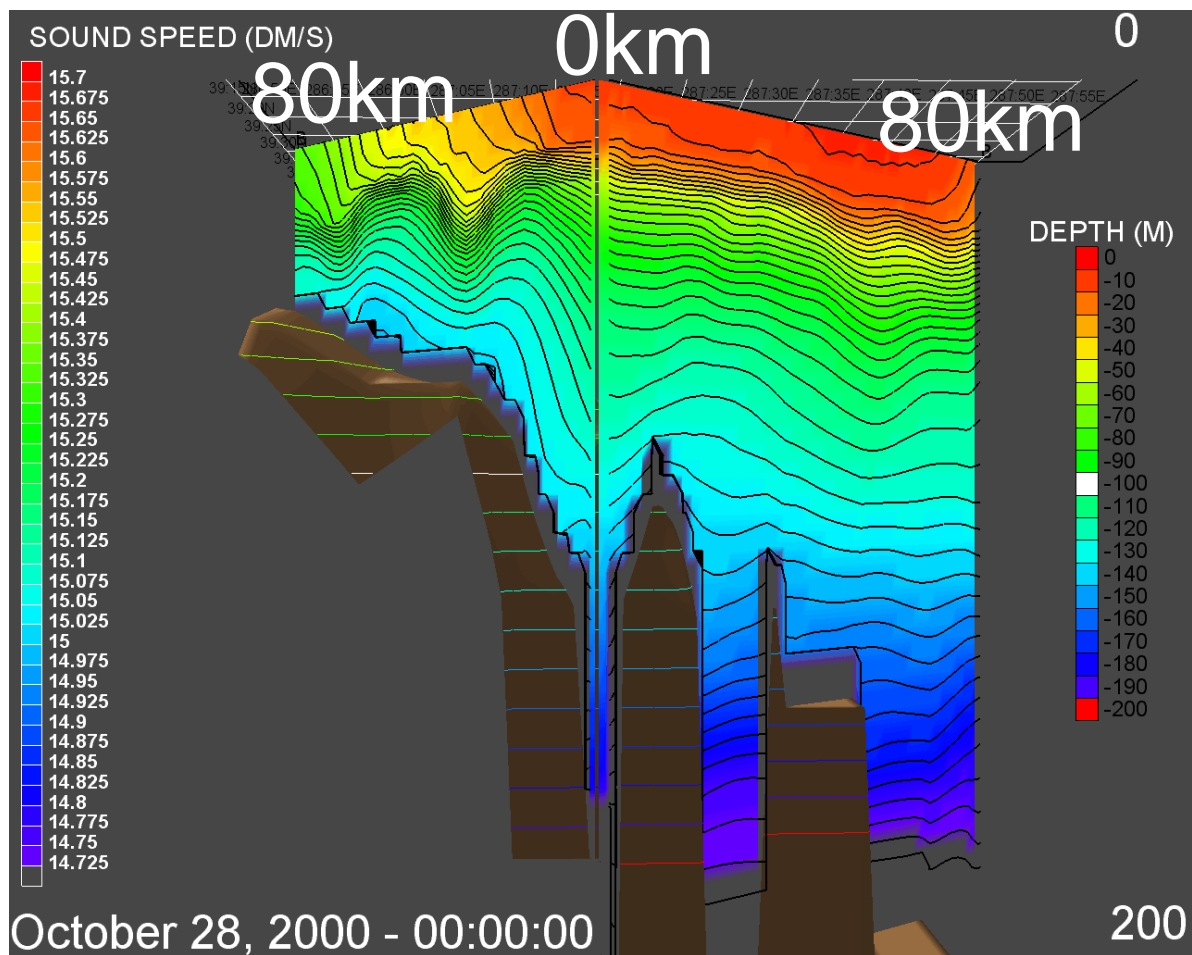
Initial Conditions and Forcing

- Initial and Open Boundary Conditions
 - NCOM Global $1/8^\circ$ Model
 - Currents (U, V)
 - Temperature
 - Salinity
 - Sea surface elevation
 - ADCIRC
 - 8 Tidal components
- Atmospheric Forcing
 - Coupled Ocean Atmosphere Prediction System (COAMPS) West Atlantic Domain
 - Wind Stresses

MAB Nests

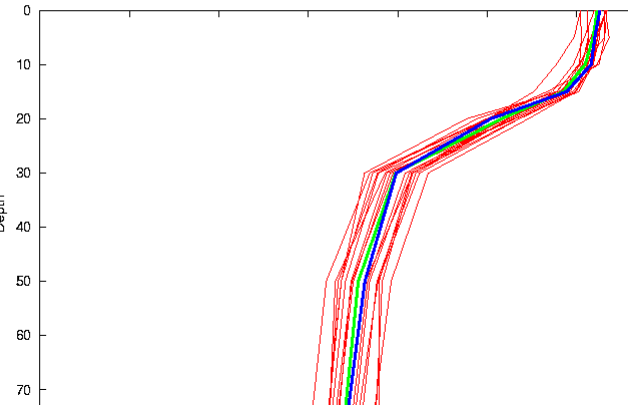


Internal Wave

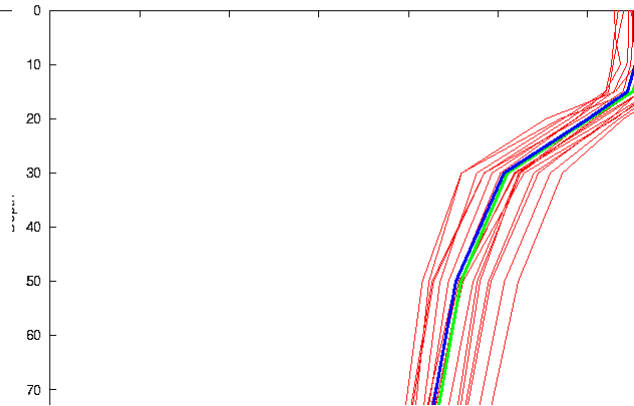


2000

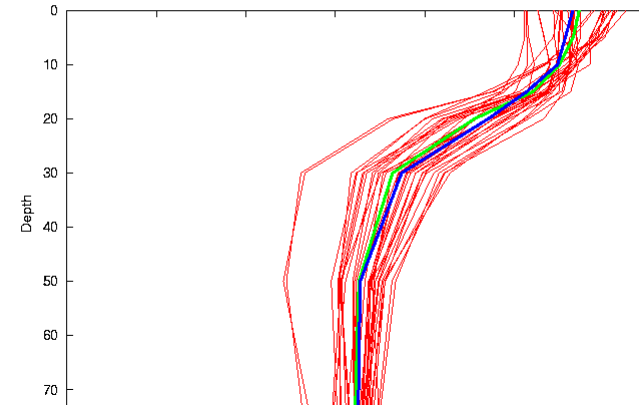
nest2 2000 : cluster 1 of 3
Green=Center Blue=BestMatch



nest2 2000 : cluster 2 of 3
Green=Center Blue=BestMatch

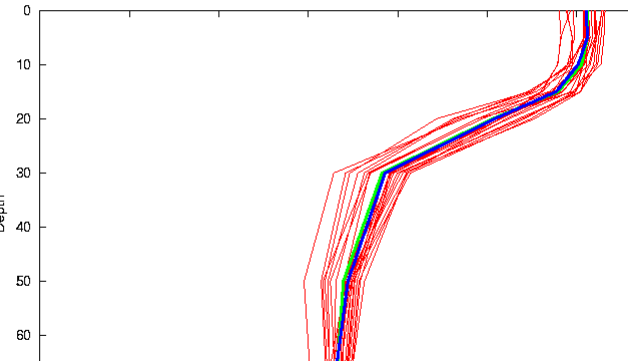


nest2 2000 : cluster 3 of 3
Green=Center Blue=BestMatch

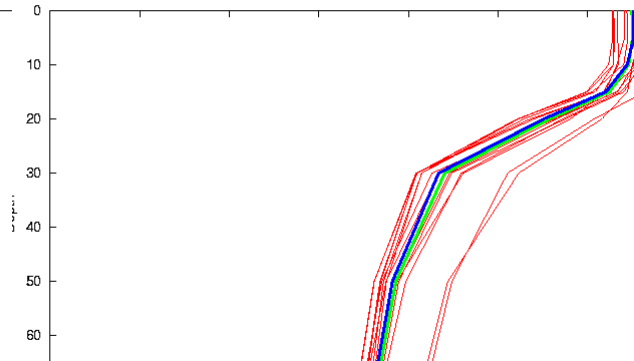


2002

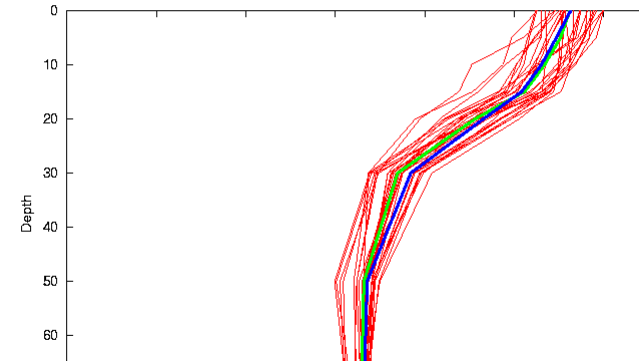
nest2 2002 : cluster 3 of 3
Green=Center Blue=BestMatch



nest2 2002 : cluster 1 of 3
Green=Center Blue=BestMatch

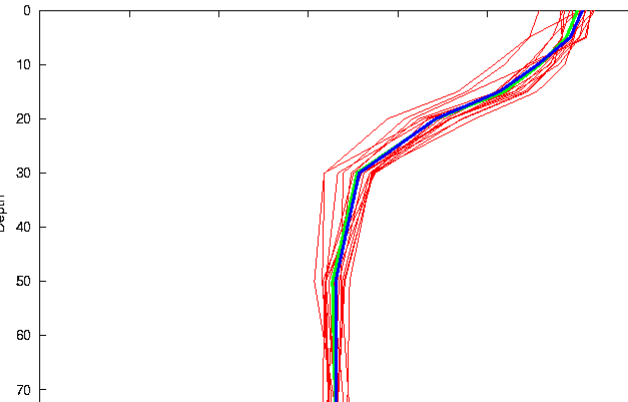


nest2 2002 : cluster 2 of 3
Green=Center Blue=BestMatch

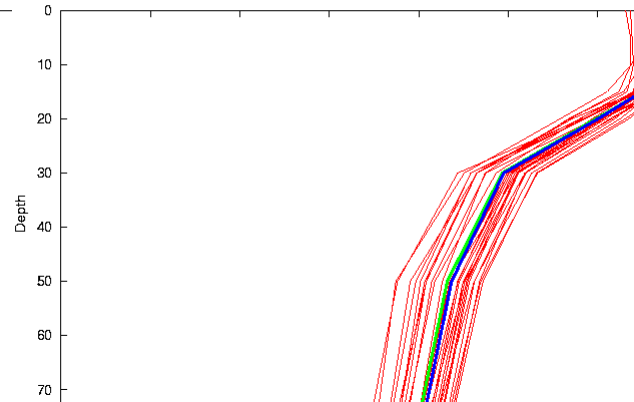


2003

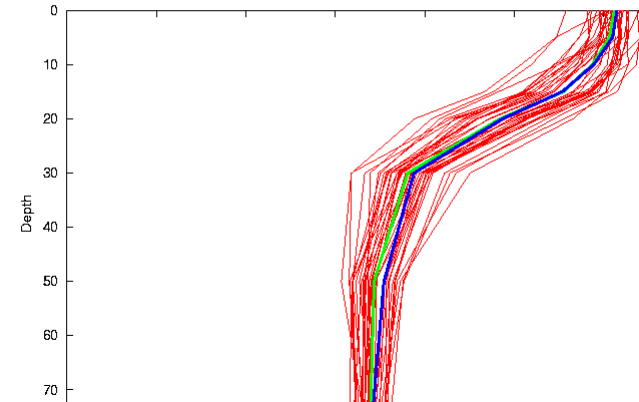
nest2 2003 : cluster 3 of 3
Green=Center Blue=BestMatch



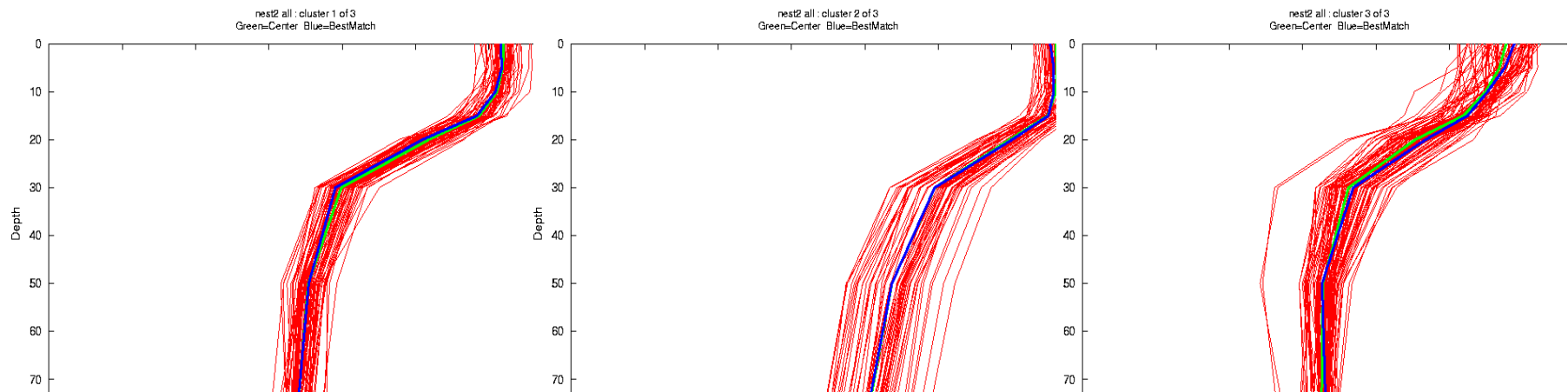
nest2 2003 : cluster 1 of 3
Green=Center Blue=BestMatch



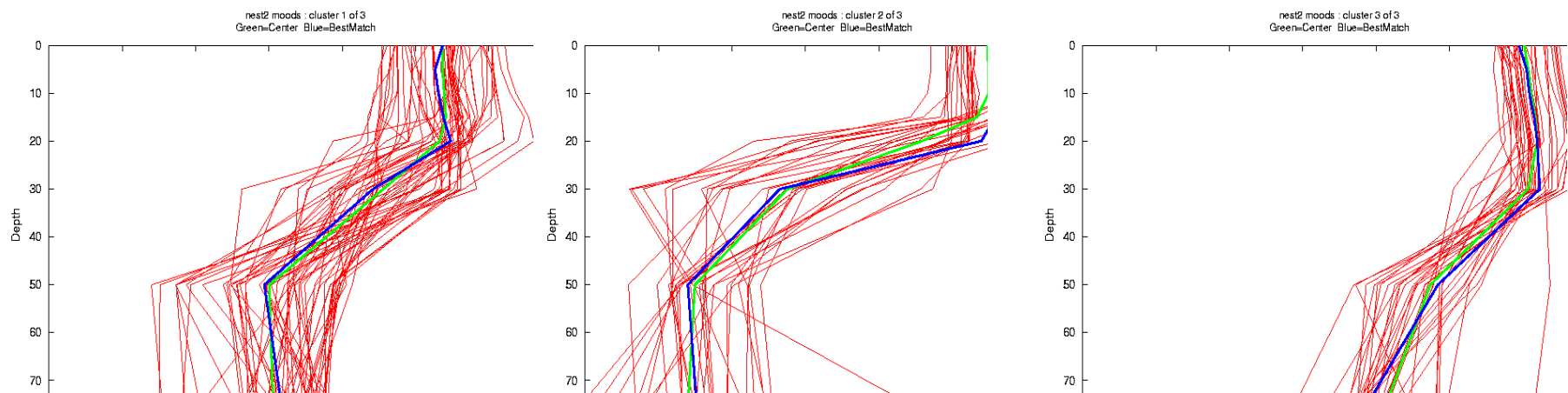
nest2 2003 : cluster 2 of 2
Green=Center Blue=BestMatch



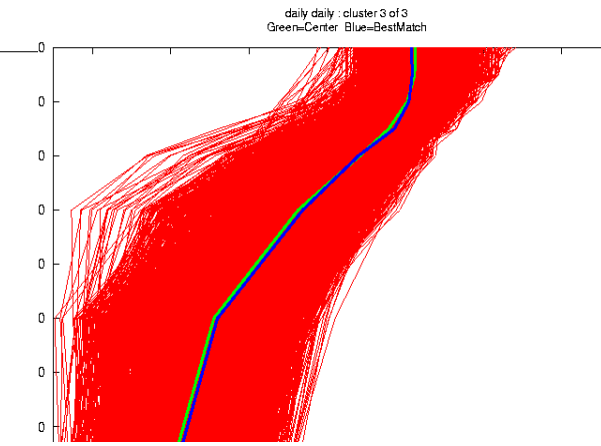
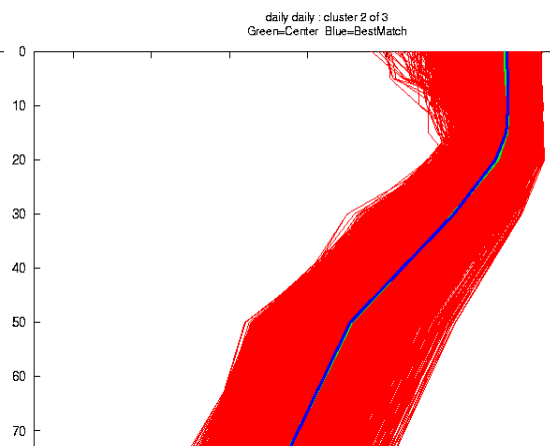
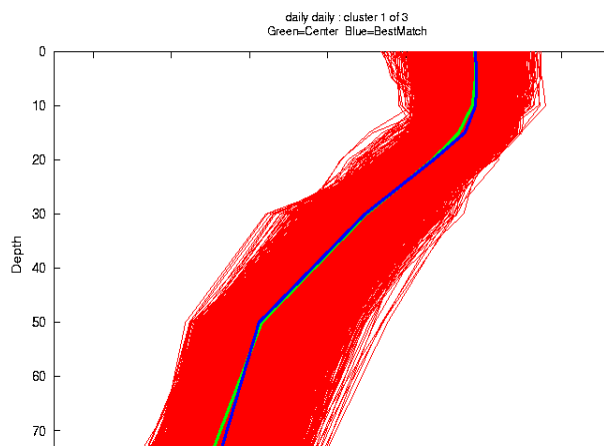
All



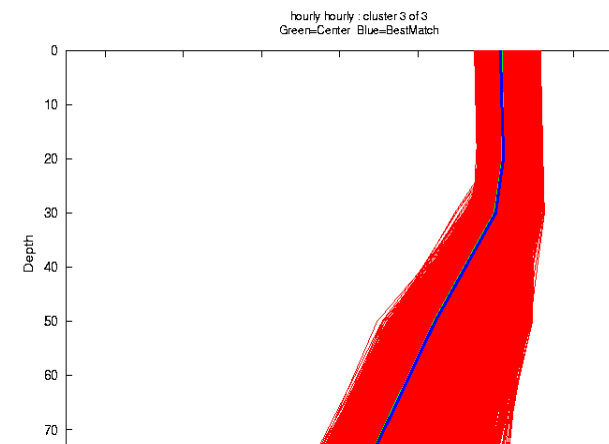
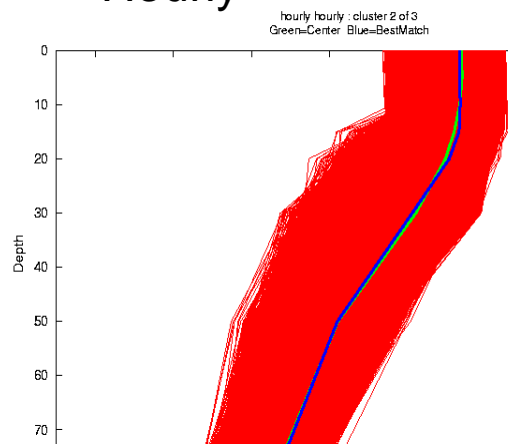
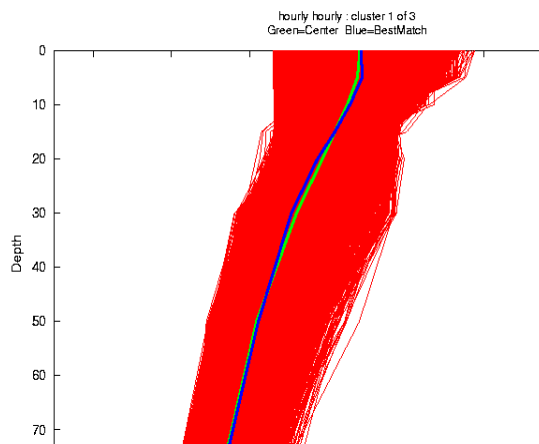
NODC



Daily

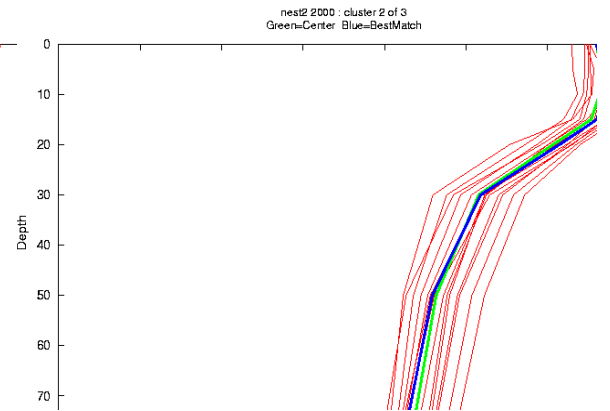
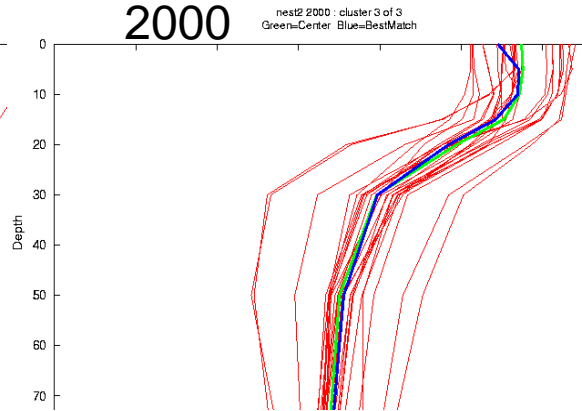
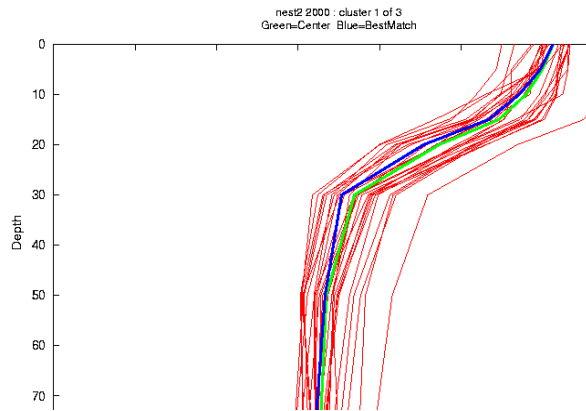


Hourly

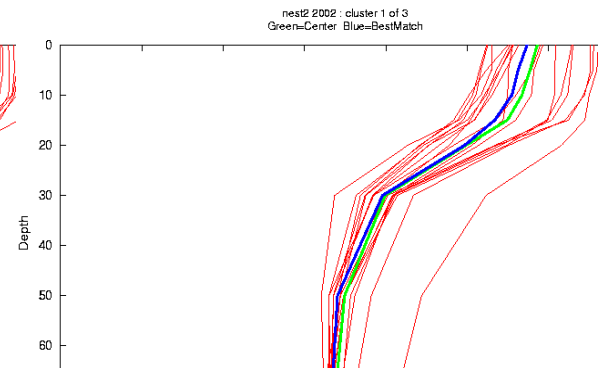
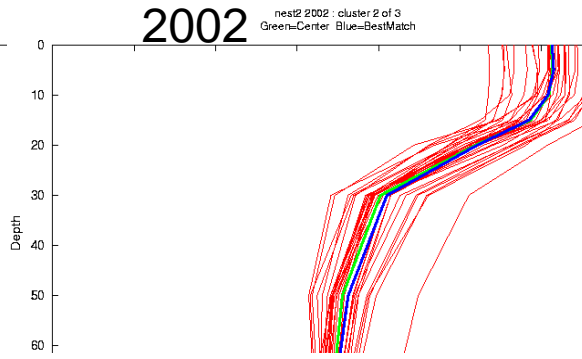
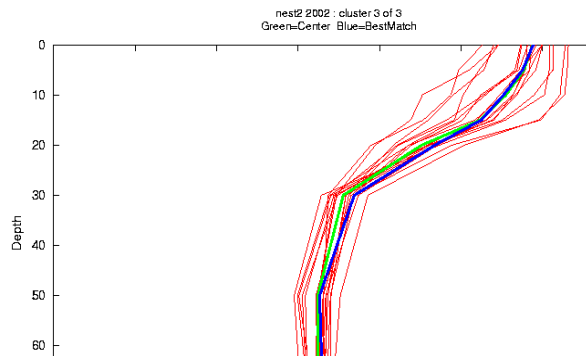


Augmented

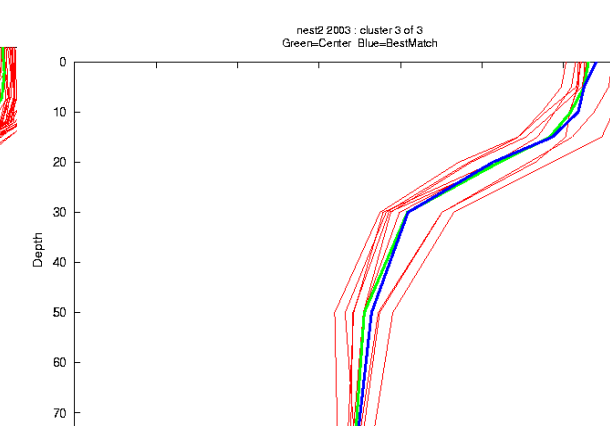
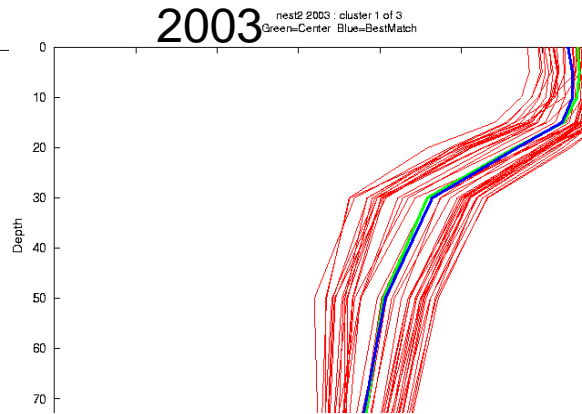
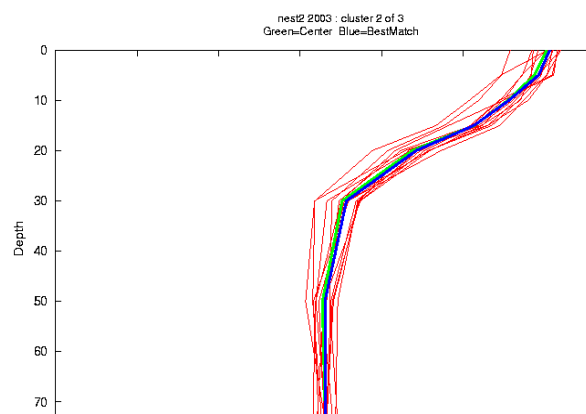
2000



2002

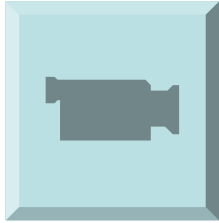
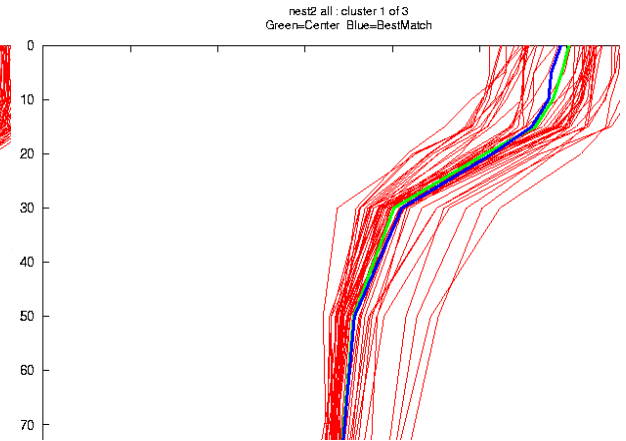
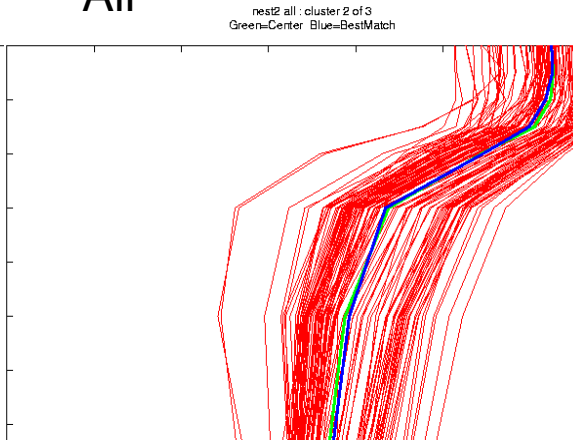
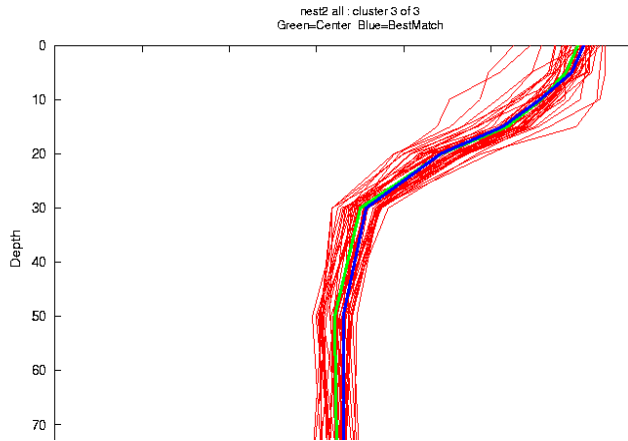


2003

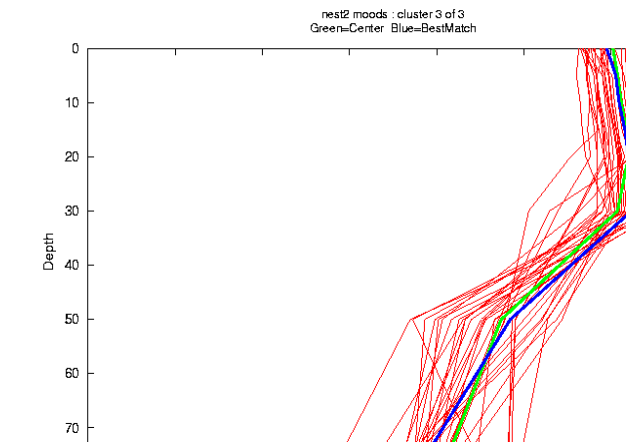
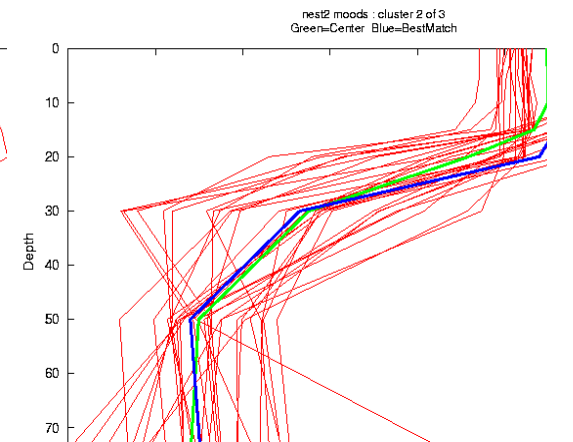
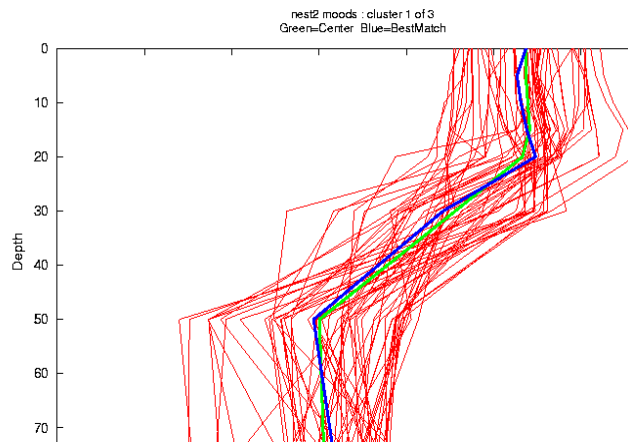
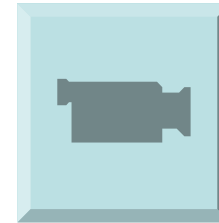


Augmented

All



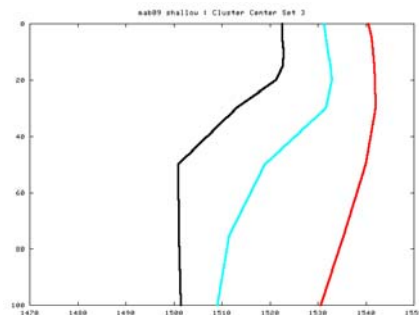
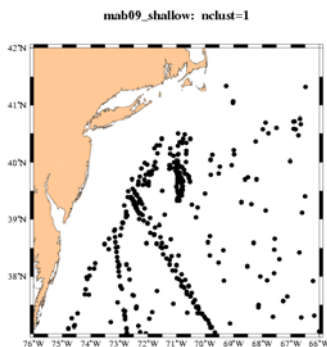
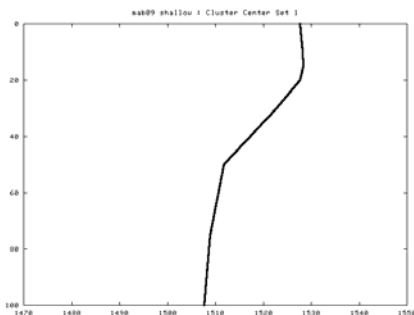
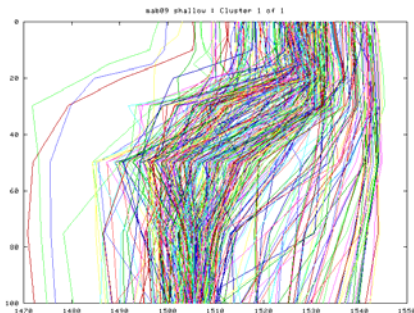
NODC



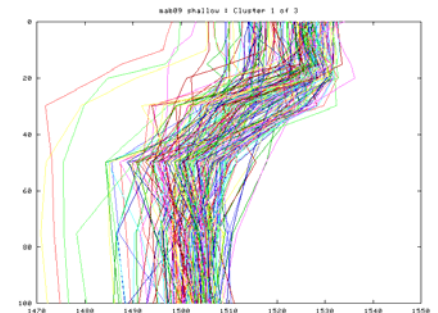
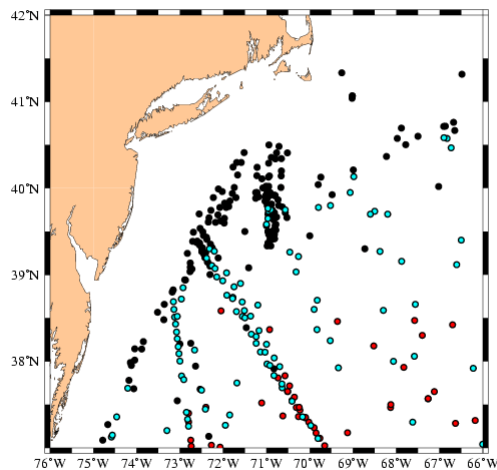
Mid-Atlantic Bight Profiles

Sept 1993 – 2002

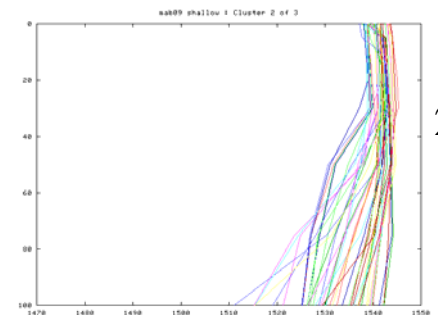
Upper 100 meters: Case of 3
presumed clusters



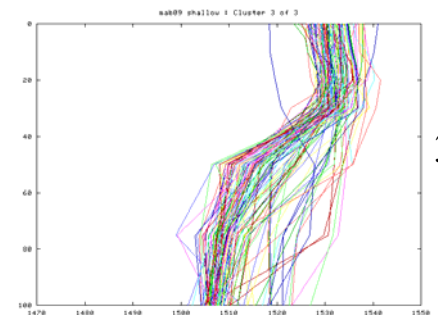
mab09_shallow: nclust=3



1



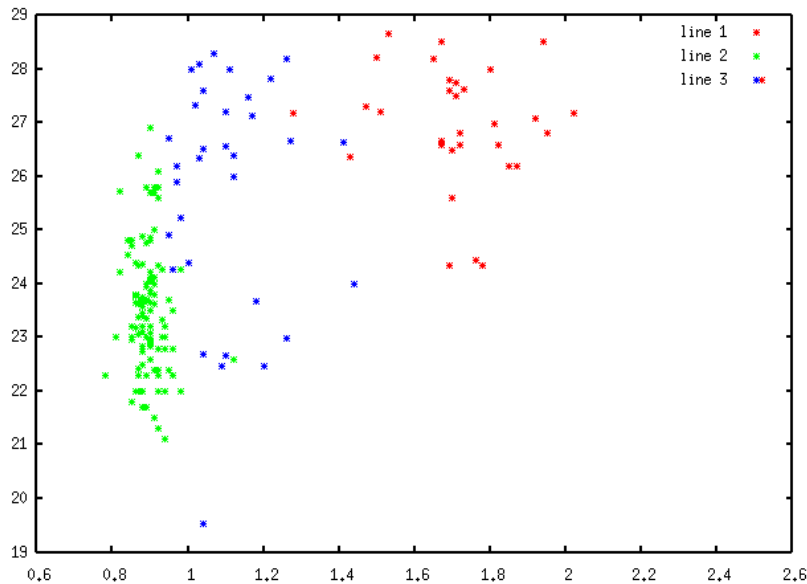
2



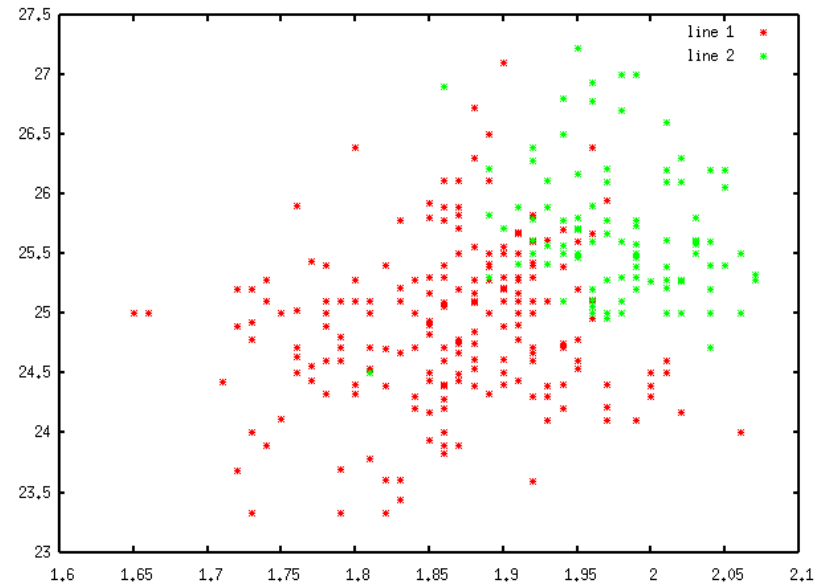
3

Cluster-based Approach to Improving MODAS Synthetics

Clusters separate in (dynamic height, surface temperature) space



Mid-Atlantic Bight



Hawaii (RIMPAC-04)

Approach : Derive synthetics on a per-cluster basis, and use remote sensed height and temperature to determine probability of being in cluster #N and weight synthetics appropriately.

NRL Contributions

- Comparison of uncertainty in model simulations (NCOM) and historic data set (NODC) using cluster analysis, Gallacher, Fox, Schaferkotter (to be submitted to refereed journal)
- Regional and Mesoscale Models Nested in a Global Model: Dynamics and Boundary Conditions, Gallacher, P. C., M. R. Schaferkotter and S. Piacsek, TOS meeting, 2003
- The Impact on the Sound Speed Field of Internal Bores and Large Amplitude Internal Waves in the Continental Shelf/Slope Region, P. C. Gallacher, S. Piacsek and M. Schaferkotter, TOS meeting, 2004
- Cluster based Improvement to MODAS, Dan Fox, Transition product